 0030-0950/84/0005-0248 $2.00/0

# CONTROL OF NUISANCE AQUATIC PLANTS WITH BURLAP SCREEN[1]

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ABSTRACT. Ten-ounce burlap was applied as a sediment cover in June 1982 to two plots on Lake Rockwell (Portage Co., Ohio). The burlap at one of the plots was treated with a rot-retarding material, Netset. Plant biomass on treated plots was compared to adjacent plots. The application of burlap was effective for seasonal control of aquatic plant growth on a site where material could be tautly secured to the reservoir sediments. It was less effective at a site with highly unconsolidated sediments. Burlap would have to be applied annually since it rotted during the summer even with preservative treatment. The material cost of burlap is about 15-50% of commercial screening products.

OHIO J. SCI. 84 (5): 248-251, 1984

## INTRODUCTION

Aquatic vascular plants are characteristic inhabitants of lakes and reservoirs and often reach nuisance proportions in many of them. Their role in sediment accumulation and loss of reservoir storage capacity is just beginning to be understood. Aquatic plants also contribute nutrients to the water column through their decay and through establishment of reducing conditions during detritus oxidation enabling nutrient release from the sediments. (Barko and Smart 1980, Carpenter 1980). The nutrients released by aquatic plants often subsidize algal blooms creating additional water quality problems such as dissolved oxygen depletion. Dense growths of aquatic plants detract from recreational quality and may prevent swimming, boating, and fishing.

Techniques to control aquatic plants include substrate disruption, winter water level drawdown, harvesting, and herbicides. Selecting the best control method or methods is influenced by field conditions, cost, and management objectives. A very successful technique is the use of sediment screens. Several screening materials have been tested (Cooke 1980), the most effective being a PVC-coated fiberglass (Perkins et al. 1980). The material cost of fiberglass screens is high, restricting use to limited treatment areas such as beaches and marinas. This study was initiated to assess the effectiveness of burlap as an inexpensive alternate sediment cover material to control aquatic plant growth.

## METHODS AND MATERIALS

The study areas were located on Lake Rockwell (Portage Co., Ohio, fig. 1). A water supply reservoir for Akron, Ohio, Lake Rockwell was formed in 1914 through construction of a gravity dam across the Cuyahoga River approximately 4.0 km northeast of Kent, Ohio. It has a storage capacity of $(10.08)10^6\,m^3$, an area of 300 ha, a mean depth of 3.9 m and a maximum depth of 6.1 m. Thermal stratification occurs only in the deep waters near the dam. The reservoir is eutrophic, supports dense populations of aquatic plants, and experiences severe blue-green algal blooms during summer months.

On 2 June 1982, two study grids were established as part of a water supply evaluation conducted by Burgess & Niple, Limited and Kent State University (fig. 1). The Duckbay site measured 15.3 m by 18.3 m. The substrate of half of this grid was covered with overlapping strips of burlap treated with Netset, an asphalt base commercial sealant, used to preserve fish nets and seines. Burlap was purchased from Hanes Converting Company (Brooklyn, NY) and Netset from Nichols Net and Twine Company (East Saint Louis, IL). The sealant was prepared by diluting 57 l of Netset with 57 l of mineral spirits. This mixture was applied to 139 $m^2$ of burlap and allowed to dry before the burlap was installed in the reservoir. The 114-l mixture provided a light/moderate treatment of the burlap. The remaining

[1]Manuscript received 8 March 1983 and in revised form 19 July 1984 (#83-7).

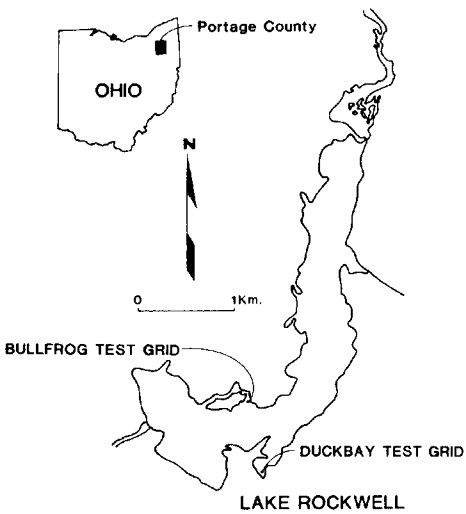


FIGURE 1. Lake Rockwell Location Map. N41°-10'00"–W81°19'00".

half of the grid was to serve as a control plot. Burlap was applied so as to ensure similar conditions of sunlight and water depth over the control and test plots. Water depth over the grid ranged from 0.5 to 1.0 m. Water levels in the reservoir ranged no more than about 7.5 cm throughout the study.

The Bullfrog site measured 7.5 m by 18.3 m. Half of the grid bottom was covered with untreated burlap while the control half was not covered. Water depth over the grid ranged from 0.3 to 1.0 m. Common conditions of light and water depth occurred over the test and control plots as at the Duckbay grid.

Burlap was distributed in the water from a one-m spool mounted on a wooden frame positioned at the stern of a row boat. Two members of a three-man crew applied burlap with the aid of SCUBA. The third crew member positioned the boat and maintained a continuous supply of burlap for application. The burlap strips were secured to the sediment with steel staples driven through the burlap and into the sediment at two-m intervals. The staples were formed from one-m lengths of 4.76-mm diameter steel. Care was taken to ensure that each strip was pulled tautly to keep the burlap in close contact with the sediment. Each new strip overlapped the adjacent strip by 0.3 m. Both grids were marked with buoys at 1.5-m intervals along the perimeter. The buoys were serially marked to form a coordinate system for the entire grid.

On 3 June five plant biomass samples were collected from the control plots on the Duckbay and Bullfrog study grids. Five samples were again collected from the test and control plots of both grids on 8 July, 6 August, and 3 September. Sampling points were determined in advance of each sampling event by the random selection of numbers corresponding to coordinates of the grid. No sampling locations were repeated throughout the study. Samples were collected by a diver who removed by hand all plant material, including roots to a depth of 2.5 cm, contained within a 0.25 $m^2$ frame.

Each sample was reused to separate living plant material from other material and oven dried in tared vessels at 100-105°C to an oven dry weight. The results of each sampling are reported as mean gms (dry weight)/$m^2$.

## RESULTS

The burlap at Bullfrog was not nearly as efficient as at Duckbay since a thick (.6-m) layer of unconsolidated sediment impeded installation efficiency and provided an unstable base for anchoring the staple anchors. These conditions resulted in "ballooning" of the burlap strips with separation along the overlapping edges. Plants were able to grow under the "ballooned" burlap and to surface between the separated burlap strips. In spite of this phenomenon, plant growth did not occur over the burlap and the screen did cause an overall reduction in biomass production on the test plot.

The reservoir bottom at the Duckbay grid was sufficiently consolidated to allow secure placement of the staples. This ensured a continuous burlap screen that remained in close contact with the substrate throughout the study period.

The test grids were dominated by *Myriophyllum spectatum, Najas flexilis,* and *Ceratophyllum demersum.* Present in smaller numbers were *Potamogeton crispus* and *Potamogeton americanus,* plus a small stand of *Nymphaea* sp. on the edge of the Duckbay test plot. Burlap proved to be moderately effective in limiting the growth of these plants. Mean dry weight values of biomass for control and test plots of the Duckbay and Bullfrog grids are presented in table 1. The data indicate that biomass production was reduced as much as 99% during the first month of application (Duckbay). Biomass reduction on both test plots progressively declined during the second and third months of evaluation. A comparison of test and control sample data using the *t* test and a confidence limit of 90%, indicates

TABLE 1

*Biomass production on control and burlap test plots, Lake Rockwell, Ohio.**

| Sample Date | Control Plot (gm/m²) | Test Plot** (gm/m²) | Percent Reduction |
|---|---|---|---|
| | Duckbay Grid | | |
| 3 June '82 | 16.4 ± 7.1 | — | — |
| 8 July '82 | 91.3 ± 3.2 | .2 ± .3 | 99 |
| 6 Aug. '82 | 176.6 ± 5.7 | 28.3 ± 2.1 | 84 |
| 3 Sept. '82 | 58.0 ± 1.3 | 45.2 ± 1.6 | 22 |
| | Bullfrog Grid | | |
| 3 June '82 | 39.5 ± 4.8 | — | — |
| 8 July '82 | 84.2 ± 2.4 | 22.5 ± 1.9 | 73 |
| 6 Aug. '82 | 121.4 ± 3.8 | 60.8 ± 3.4 | 50 |
| 3 Sept. '82 | 68.0 ± 3.3 | 38.3 ± 2.8 | 44 |

*Sample data multiplied by 4 to provide grams (dry weight)/square meter
**Burlap treated with the preservative Netset at Duckbay Grid

that a statistically significant biomass reduction occurred at Duckbay throughout the study period, while a significant reduction was observed only during the first month of application at Bullfrog.

Both the treated and untreated burlap deteriorated considerably by the end of the observation period in September. The burlap rotted to the point that it could be torn or penetrated with the slightest pressure. In addition, a thin layer of sediment had accumulated on the burlap at Duckbay permitting *Najas flexilis* to grow on and through the burlap. The lack of significant biomass reduction during the last two months of application at Bullfrog and the steady decline at Duckbay were due in part to the difficulty in anchoring the burlap at Bullfrog and to the ability of *Najas flexilis* to grow through the burlap mesh.

The observed biomass reductions with burlap at Duckbay are comparable with reductions observed with commercial screening products through the first year of application (Cooke 1980). However, in a climate with a growing season longer than the useful life of burlap, burlap would not control plant growth as effectively as fiberglass and plastic screens. Commercial screens of fiberglass or plastic composition will remain effective so long as "ballooning" and sediment accumulations don't occur.

An important consideration in assessing the potential of burlap as a sediment screen is a comparison of the treatment costs for burlap and commercial screening products. The burlap used was a 338 gm/m$^2$ weight material (10 oz). The cost per bale (206 m$^2$) was \$604 (1982). This is equivalent to \$.34/m$^2$ and is well below the costs of two commercial screening materials, Typar (Dupont) and Aquascreen (Menardi-Southern), which sell for \$.72/m$^2$ and \$2.16/m$^2$, respectively. Since the installation procedures are the same for burlap and commercial screens, there is no difference in the installation costs for each material.

## CONCLUSIONS

Burlap provided an effective screen for seasonal control of aquatic plants. The useful life of burlap is estimated to be three to five mo. Treatment with the preservative Netset did not enhance the useful life or effectiveness of burlap. A heavier application of Netset than was used in this study might increase the useful life of burlap.

It was observed that the predominant plant which grew on and through the burlap was *Najas flexilis,* a common nuisance aquatic plant in Ohio. In a lake or reservoir where *N. flexilis* or similar species are not prevalent, the effectiveness of burlap screening may be enhanced.

Commercial screens of fiberglass and plastic composition typically range from two to six times the cost of burlap. Unlike burlap, these commercial screens have a much longer useful life.

There are a number of conditions in which burlap might be preferred as a sediment screen over commercial screening products. Burlap may be appropriate in cases where long-term weed control is not required, including applications to beaches and launch areas that are only used on a periodic basis. Burlap is advantageous in such cases because it is inexpensive and biodegradable which precludes the effort and costs of retrieval.

Burlap might also be preferred where there is a limited budget for aquatic weed control. The lower cost associated with burlap may enable utilization of sediment screens to control plant growth when the costs of commercial screens would be prohibitive.

Finally, burlap may be more effective in reservoirs or lakes with high sedimentation rates. In such areas, the effectiveness of screening is ultimately limited by plant growth on the screen unless there is periodic maintenance to clear the screen of plant and sediment accumulations. Where annual maintenance is required for sediment screens, the same degree of weed control might be achieved with burlap at a lower cost.

ACKNOWLEDGMENTS. The authors acknowledge the City of Akron, Ohio, particularly Walter Strawman and Art Youngblood of the Akron Division of Water. Acknowledgement is extended to Nelson Bartel whose laboratory assistance proved invaluable.

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## EDITOR'S NOTE

New manuscripts usually will be published within 7 months of acceptance in *The Ohio Journal of Science.*